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ABSTRACT

The purpose, organization, and functions of research and evaluation in a large urban school district are discussed in light of several major issues in educational evaluation. Major issues include methods of assuring the credibility of evaluation information, the establishment and maintenance of meaningful reporting cycles, the recruitment and employment of qualified personnel, the release and dissemination of evaluation and research data, and the relationship between research, evaluation, planning, and development. The role of context, input, process, and product evaluation, as well as applied and basic research, in supplying the information base for educational planning and decision making is highlighted. (Author)

ED106345

The Organization and Functions of Research and Evaluation in a Large Urban School District[1]

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The purpose, organization, and functions of research and evaluation in a large urban school district are discussed in light of several major issues in educational evaluation. Major issues include methods of assuring the credibility of evaluation information, the establishment and maintenance of meaningful reporting cycles, the recruitment and employment of qualified personnel, the release and dissemination of evaluation and research data, and the relationship between research, evaluation, planning, and development. The role of context, input, process, and product evaluation, as well as applied and basic research, in supplying the information base for educational planning and decision-making is highlighted.

In recent years there has been increased emphasis on public school evaluation. Most of the major public school evaluation efforts have been formulated using some modification of several conceptual frameworks for evaluation as a guide. The four most often encountered frameworks are those attributed to Stufflebeam, et al., (1971), Scriven (1967), Stake (1967), or Provus (1971). A short discussion of each of these evaluation structures is offered as a background for the forthcoming presentation.

Probably the most comprehensive evaluation model was developed by Stufflebeam, et al., (1971), and named the CIPP Model. Evaluation was defined as the process of delineating, obtaining, and providing useful information for judging decision alternatives.

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The model identified four major types of evaluation: context evaluation to feed planning decisions, input evaluation to feed programming decisions, process evaluation to feed implementing decisions, and product evaluation to feed recycling decisions.

Briefly, context evaluation provides a rationale for determining educational objectives by defining relevant environment, describing desired and actual conditions of the environment, identifying unmet needs, and diagnosing problems that prevent needs from being met. Input evaluation assesses relevant capabilities of responsible agencies and identifies strategies for achieving the objectives determined through context evaluation as well as suggesting designs for implementing selected strategies. Once a strategy has been selected, process evaluation provides periodic feedback to persons concerned with the implementation of plans and procedures to predict or detect faults in procedural design or implementation so that interim adjustments may be made if warranted. Finally, product evaluation provides interim and final assessment of the effects of educational programs. That is, product evaluation assesses the effects of the strategy selected through input evaluation to meet the need identified by context evaluation. Such assessment is completed in light of process evaluation data.

Scriven (1967) conceptualized an extremely straightforward and widely accepted evaluation framework. It is not nearly so comprehensive as the CIPP Model and is largely concerned with the process-product portion of Stufflebeam's structure. According to Scriven,

the major goal of evaluation is to make credible judgment relative to the merits of educational programs. Within a discussion of methods of accomplishing the goal, he introduced the concepts of formative and summative evaluation.

The focus of formative evaluation is upon program improvement. Thus, formative evaluation attempts to provide feedback to program personnel with the goal of upgrading or improving an educational program while it is in the developmental stage. In the CIPP vernacular, interim product and process data provide formative evaluation information to program personnel.

The focus of summative evaluation is upon the determination of the ultimate worth of a program or project. This type of evaluation should be implemented at that stage in a program's life where it has reached some stability. Summative data feed recycling decisions; that is, as a result of summative evaluation information, a program may be terminated, restructured, continued, or expanded. In the CIPP vernacular, final product evaluation information, interpreted in consideration of context, input, and process data, is used to draw summative conclusions about the merits of an educational program and feed recycling decisions.

Stake (1967) suggested that evaluation ought to be concerned with three classes of conditions: antecedents, transactions, and outcomes. Antecedents are defined as those conditions which exist prior to program implementation, i.e., the educational context. Transactions are interactions between students, teachers, and materials. Outcomes are defined as the intended products of transactions.

Three classes of activities were suggested by Stake. The first involved providing assistance to program staff in generating a clear statement of the program or project rationale. The second involved the generation of descriptive data. Descriptive data include statements regarding intended and actual antecedents, transactions, and outcomes. Thus a check of the congruence between planned and observed antecedents, transactions, and outcomes can be made. Stake also suggested an examination of the contingencies within intended (logical contingency analysis) and observed antecedents, transactions, and outcomes. The contingency analysis within intents is similar to CIPP's input evaluation while that within observed data attempts to identify cause and effect relationships between antecedents, transactions, and outcomes.

The third class of activities involved the generation of judgments about the worth of educational programs. Stake suggested that such judgments be made on the basis of both absolute and relative criteria and by a variety of individuals. In other words, programs should be assessed both in terms of the degree to which they attain absolute, and sometimes arbitrary, goals and of the degree to which they attain those goals relative to other programs with similar goals or objectives.

Provus (1971) suggested that all projects move through design, installation, process, and product stages. During each stage the evaluator must delineate, in conjunction with project staff, a set of standards which can be used as a basis for comparison with program

performance. It is the evaluator's function to make comparisons between standards and performance, to identify discrepancies at each stage, and to report those discrepancies to project management who have the option of terminating the program, proceeding to the next stage, or modifying the program in some way. The product of the design stage is a set of standards used to judge the effects of program efforts in each of the three succeeding stages. At every stage the object of the evaluation is to provide useful data for decisions about program improvement or recycling.

The four generic evaluation frameworks described above are supplemented in the evaluation literature by a plethora of articles dealing with evaluation methodology, purposes, instrumentation, strategies, and variables to be considered in evaluation. In addition, the research literature boasts literally thousands of articles dealing with research on most areas of the cognitive, affective, and psychomotor domains. The more scientific of such studies have been called disciplined inquiry by Cronbach and Suppes (1969). According to those authors, regardless of whether such inquiry is called evaluation or research (or any number of other terms), a dependence on objectivity and evidential test is central. In the words of Cronbach and Suppes:

> Disciplined inquiry has a quality that distinguishes it from other sources of opinion and belief. The disciplined inquiry is conducted and reported in such a way that the argument can be painstakingly examined. The report does not depend for its appeal on the eloquence of the writer or on any surface plausibility. The argument is not justified by

> anecdotes or casually assembled fragments of evidence. Scholars in each field have developed traditional questions that serve as touchstones to separate sound argument from incomplete or questionable argument. Among other things, the mathematician asks about axioms, the historian about the authenticity of documents, the experimental scientist about verifiability of observations. Whatever the character of a study, if it is disciplined the investigator has anticipated the traditional questions that are pertinent. He institutes controls at each step of information collection and reasoning to avoid the sources of error to which these questions refer. If the errors cannot be eliminated, he takes them into account by discussing the margin for error in his conclusions. Thus the report of a disciplined inquiry has a texture that displays the raw materials entering the argument and the logical processes by which they were compressed and rearranged to make the conclusion credible....
>
> Disciplined inquiry does not necessarily follow well-established formal procedures. Some of the most excellent inquiry is free-ranging and speculative in its initial stages, trying what might seem to be bizarre combinations of ideas and procedures, or restlessly casting about for ideas.... But ... fundamental to disciplined inquiry is its central attitude, which places a premium on objectivity and evidential test [Cronbach and Suppes, 1969, pp. 15-16, 18].

Research and evaluation in a public school environment must attempt to bring disciplined inquiry to bear upon educational decisions. The model discussed in this paper is an attempt to build upon the work of Stufflebeam and Scriven, as well as that of Bracht (1969), Cronbach and Snow (1969), Salomon (1973), and Webster and Mendro (1974a, 1974b), in developing a straightforward operational model integrating evaluation functions with those of systematic applied and basic research.

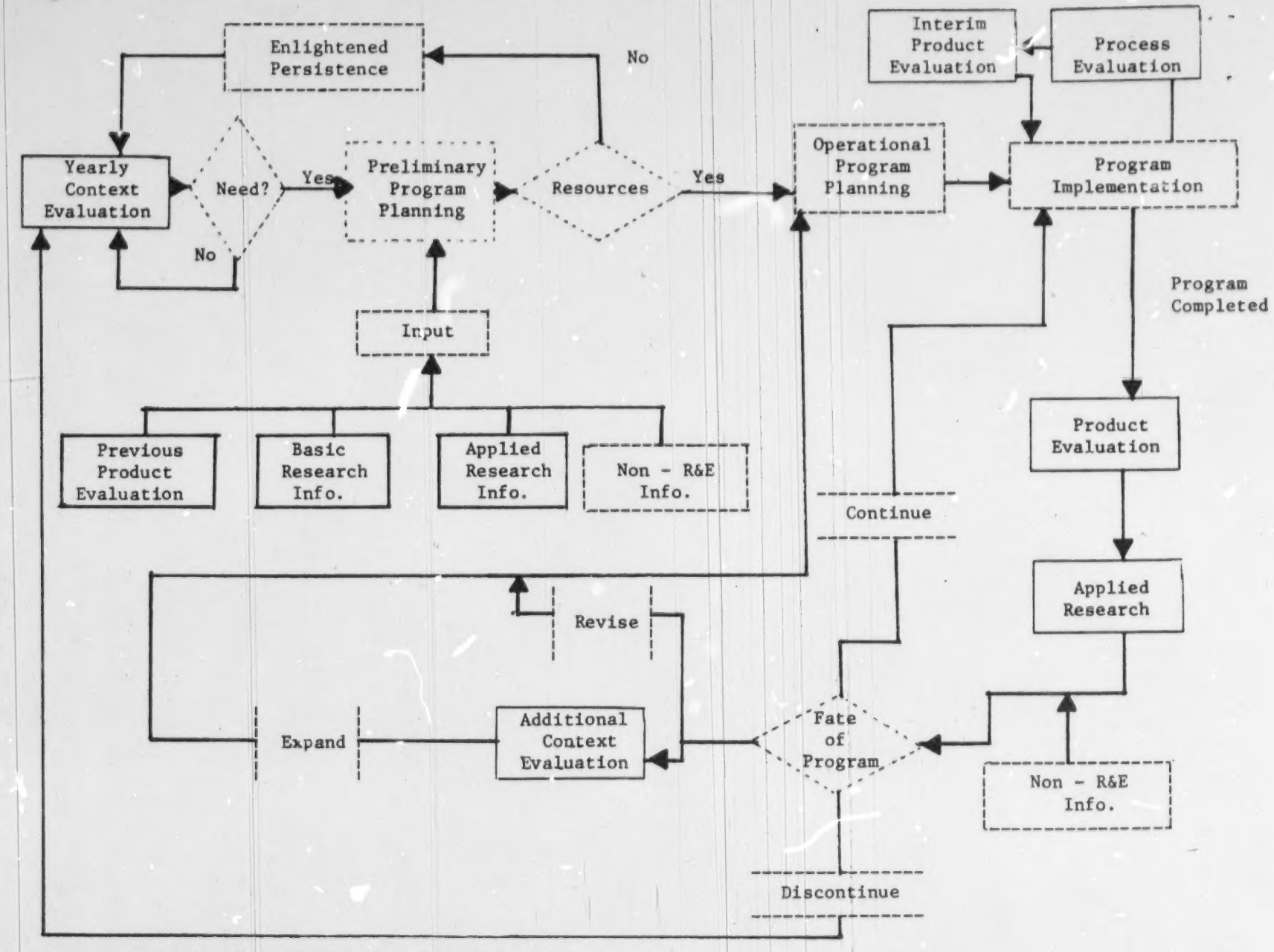
The Model

The research and evaluation model employed in the Dallas Independent School District depends heavily on Stufflebeam's conceptualization of the CIPP Model.[1] The Dallas Model posits a comprehensive management-oriented system which highlights the interrelationship between evaluation and research while indicating the role of each in the process of educational renewal. Figure 1.0 presents a flowchart outlining the essential operational features of the model. The remainder of this section of the paper will be devoted to explicating Figure 1.0.

A prerequisite to improvement must be a knowledge of existing performance levels. Thus, the backbone of any renewal system must be a comprehensive context evaluation program. Stufflebeam, et al., (1971) define context evaluation as the provision of baseline information that delineates the environment of interest, describes desired and actual conditions pertaining to the environment, identifies unmet needs and unused opportunities, and diagnoses the problems that prevent needs from being met and opportunities from being used. An adequate context evaluation system is founded on a longitudinal data base and provides periodic reports on such variables as student dropout, attendance, achievement levels, drug usage, demographic and vocational patterns; community socioeconomic status and dominant value patterns; and

[1] The major exception being a strong dependence in Dallas upon the principles of experimental design.

Figure 1: Flowchart for an Integrated Research and Evaluation System



teacher academic and demographic characteristics. Thus, a context evaluation system provides the basis for formulating change objectives by identifying needs and, in some cases, outlining practical constraints in identified problem areas.

Figure 2.0 outlines the basic components of an operational context evaluation system. In addition to those investigations outlined in Figure 2.0, which are conducted annually, a number of specific needs assessments are conducted as they relate to specific problem areas. Examples include a recent assessment of the extent of individualization in District classrooms, a recent survey of drug usage among public school children, and a current study of the perceptions of patrons, educational community, and students regarding the worthiness and effectiveness of current and proposed educational practices.

Figure 2.0. Annual Context Evaluation

2.1 Measurement Profiles - a summary of the results of the District's system-wide norm-referenced testing program in addition to community socio-economic data and a profile of the District's teaching staff. Results are cumulated by school community and are presented as they relate to national, large city, and local norms. Largely descriptive in nature, these profiles are used to inform educators and patrons of the relative quality of education in the District and to diagnose gross weaknesses in the instructional program.

2.2 *Criterion-Referenced Testing Profiles - a summary of the results of the District's criterion-referenced testing program. These are used as a supplement to the Measurement Profiles and provide estimates of the functional literacy of school children.*

2.3 *Graduate Follow-Up Studies - a series of studies on graduates of the District's schools. These include comprehensive data on graduate employment, education, attitudes, life-status, etc., that are used to determine the extent to which District programs are meeting student needs. The resulting data are then used as a guide to curriculum planning. One-and-five-year follow-ups are conducted.*

2.4 *Dropout Studies - a series of studies designed to provide descriptive data on dropouts, information about variables associated with dropout, the interactions among such variables, and trends in dropout. Emphasis is on the early identification of potential dropouts so that intervention strategies may be implemented.*

2.5 *Input Variable Studies - a continuous monitoring of the input to District schools. These studies provide the cost data for cost-benefit and cost-effectiveness analyses, as well as data on the schooling environment.*

2.6 *Measurement Studies - a series of studies on the reliability, validity, and comparability of various tests used with District students. These studies provide estimates of the degree of faith that can be placed in test data.*

2.7 *Longitudinal Trend Studies - a series of studies investigating achievement, enrollment, and community trends over time. These studies provide an accountability function.*

2.8 *Teacher and School Effectiveness Indices - a system designed to produce student gain statistics on norm-referenced (fall to fall) and criterion-referenced (spring to spring) tests. The system identifies teachers and schools that are doing better than expected as well as teachers and schools that are doing more poorly than expected, thus flagging those specific situations for additional study.*

In order to meet fully the information needs of planning decisions, a context evaluation system must include the capability of providing valid projections of the future level of certain important variables. Figure 3.0 outlines the general areas of future-oriented projection studies that provide crucial information for most major educational decisions.

Figure 3.0. Projection Studies

3.1 Student Demographic and Enrollment Study - a study designed to project and locate population and provide forecasts of future school enrollments within specified regions for the purpose of providing long-range planning information needed to determine trends and expected demands on educational facilities, staff, and programs.

3.2 Faculty Flow Study - a study designed to project the number and cost of teachers required under a multiplicity of policy and/or environmental changes. The study will project the number and characteristics of teachers who will terminate, remain, or need to be hired. Such information is useful for teacher contract evaluation, proposed legislation evaluation, staffing projections, and hiring/termination analyses.

3.3 Facilities Study - a study designed to project the amount, type, and cost of required space areas and to compare projected requirements with the existing inventory of space in order to determine deficiencies or excesses by individual school or demographic area. Such information feeds construction and school attendance zoning decisions.

3.4 Financial Study - a study designed to obtain an overall financial projection of District needs based on input from the preceding studies. Features include projection of state-aid funding, debt-service analyses and new bond requirements, revenue and expenditure analyses, and tax-rate-demand analyses.

These studies encompass many variables and are designed to aid decision makers in making intelligent data-based decisions about the future. In addition, projection models dealing with specific problems, such as cafeteria inventory and ordering, are designed upon request and receipt of high enough priority to allow funding.

Once the context evaluation system has identified needs, decision makers must prioritize those needs and focus upon reducing the discrepancy between desired and existing conditions by establishing goals for those needs that receive highest priority. It is at this point in time that input evaluation information is brought to bear. Stufflebeam, et al., (1971), define input evaluation as the provision of information for determining methods of resource utilization for accomplishing program goals. In a functioning evaluation system, there are four major sources of input information:

1. previous summative product evaluation information,
2. basic research information,
3. applied research information, and
4. non-research and evaluation information.

Summative product evaluation information concerns the extent to which specific project or program goals are achieved. When product evaluation information is available relative to a given program with goals similar to those identified in response to context evaluation information, that information provides useful input to decision makers in determining the probability that the program would reduce the identified discrepancy between desired and existing conditions.

Basic research information pertains to information about fundamental relationships that affect student learning. Before making a decision to implement a given program, decision makers should be apprised of the extent to which that program is or is not consistent with the principles established by basic research in learning and development.

Applied research information concerns the interaction between student characteristics, teacher characteristics, and instructional systems. Applied research differs from basic research in that the information provided is more closely related to specific decisions in an applied educational setting. Decision makers need information relative to the types of students (e.g., high anxiety versus low anxiety) that function best in given instructional systems implemented by teachers with different types of characteristics or traits. Applied research must be implemented in the public schools by public school research departments. Basic research should probably be implemented in the universities in conjunction with the public schools, since many local boards of education are probably too impatient for results and are unlikely to wait for a long-term, systematic, longitudinal basic research program to reach fruition.

Finally, non-research and evaluation information must enter into most educational decisions. Such information as capabilities of staff members, costs, political feasibility of program implementation, and existing facilities must be taken into account.

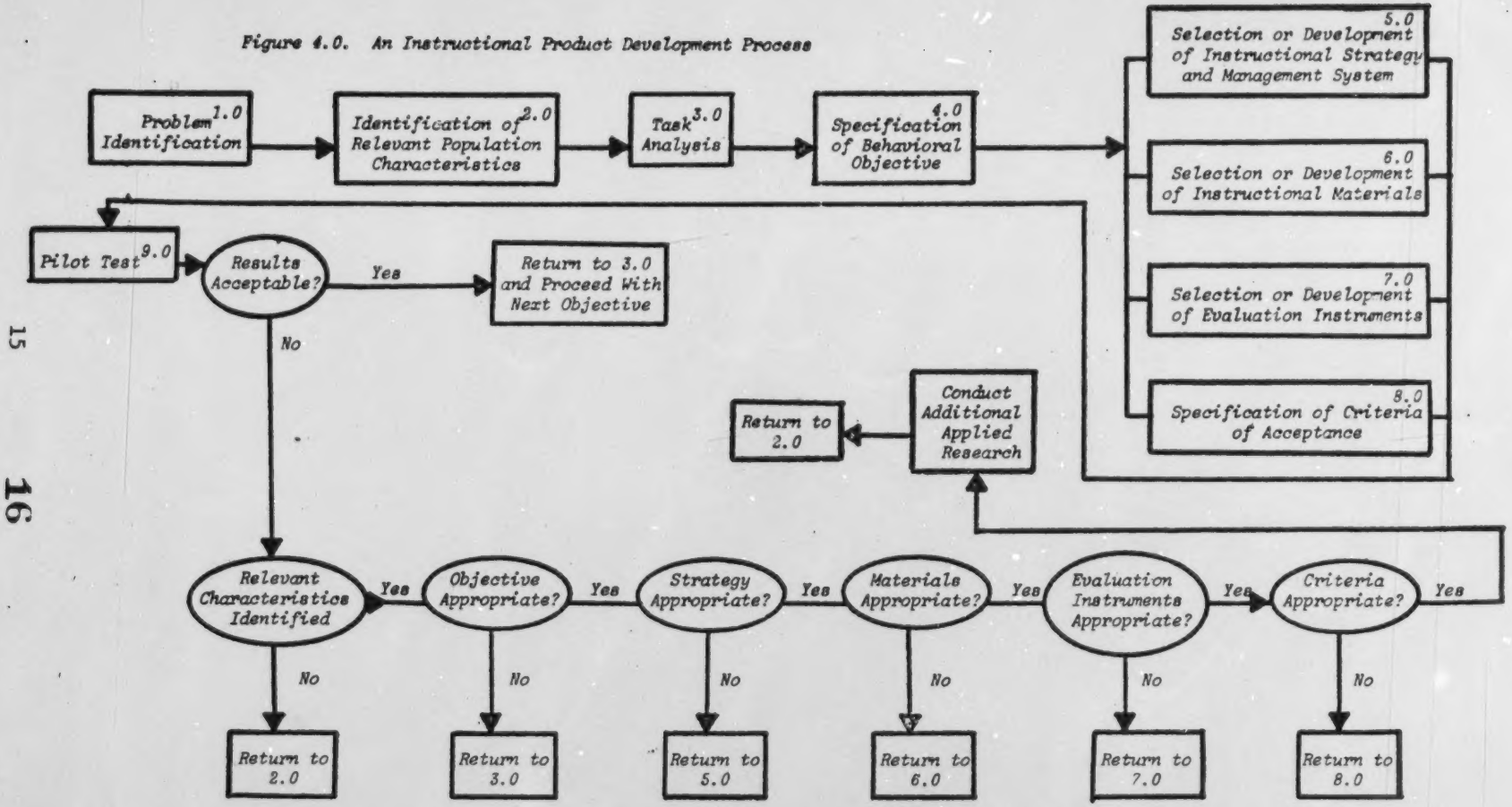
After the collection of relevant input information feeding the

preliminary program planning stage, decision makers determine whether or not sufficient resources are available to make the desired instructional changes. Quite often, adequate resources are not available and some compromise is necessary. In many cases, the lack of resources is not limited to the realm of cost and political feasibility but rather stems from an insufficient base of research information. Thus, educators are often in the position of having sufficient material resources but insufficient information resources.

If sufficient material resources are not available, the system may have to exist for some period of time in a state of enlightened persistence. Periodic context evaluation will continue to highlight the extent of discrepancy between that which is desired and that which exists. If the problem results from insufficient information resources, programs are often implemented without sufficient support data and an information base is built through a series of systematic evaluation and applied research studies.

To cope with the problem of insufficient information resources, development centers are established. These centers are charged with the responsibility of developing instructional systems to meet the needs outlined by context evaluation. Materials and instructional systems are developed at the local level only if no potentially useful commercially developed materials are available, since the development of instructional systems is an extremely costly proposition. Figure 4.0 outlines the developmental process that theoretically is followed in developing instructional systems. Centers serve specific

Figure 4.0. An Instructional Product Development Process



student populations stratified by achievement levels, ethnic background, and socioeconomic status.[2]

The Department of Research, Evaluation, and Information Systems provides technical assistance to project management in identifying population characteristics, specifying behavioral objectives, and conducting task analyses, as well as developing evaluation instruments and pilot-testing the instructional systems. Once a series of instructional systems is validated, the material is ready for expanded pilot-testing in schools similar to the setting in which the program was developed.

If sufficient material and information resources are available, or if sufficient material and minimal information resources are available, the extended program planning phase is entered. This is the phase that is entered as a result of the information gleaned from the input evaluation. The evaluator's role in the earlier phase of program planning involved making all relevant, available input information available to program planners. Once it is decided to take a particular course in remediating a demonstrated need, the evaluator must ensure that stated program objectives are measurable. Technical planners, also on the staff of the Department of Research, Evaluation, and Information Systems provide technical assistance in planning project implementation.

Out of the program planning sessions, the evaluator develops a detailed program evaluation design specifying the criteria by which the program will be judged. The development of this evaluation design

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[2]At this time, the Dallas Independent School District has two developmental centers.

must necessarily involve continuous interaction between program personnel and the evaluator in order ultimately to produce maximally effective information. Obviously, the evaluator must be independent of program management to ensure the optimum objectivity of evaluation results.

Once the program implementation phase is entered, the evaluator's role becomes one of providing continuous formative evaluation reports relative to program implementation. These reports fall primarily into two categories, process evaluation and interim product evaluation. Process evaluation has three major objectives: (1) the detection or prediction of defects in procedural design or its implementation during program implementation stages; (2) the provision of information for programmed decisions; and (3) the maintenance of a record of the implementation procedure as it occurs (Stufflebeam, et al., 1971). Thus, process evaluation information keeps program management informed of the extent to which program implementation conforms to specifications and from an evaluation standpoint, guards against the evaluation of a fictitious event.

Interim product evaluation provides periodic feedback to program management relative to the attainment of specific subobjectives during the implementation phase. Thus, process and interim product evaluation reports inform program management as to implementation and goal attainment levels while program adjustments are still feasible.

Upon completion of a given cycle of program implementation, a summative product evaluation report is prepared. This report generally addresses three areas of concern: (1) the extent to which program objectives were achieved relative to some specific set of criteria;

(2) the extent to which system objectives were achieved relative to alternative instructional strategies; and (3) the cost-effectiveness of the program relative to alternative instructional strategies. It should be obvious that information relative to these three areas of concern must be interpreted in light of process and interim product evaluation information. Without information about program implementation, product evaluation information is of little use.

Figure 5.0 outlines the necessary steps in project evaluation. The reader should bear in mind that project evaluation depends on strong experimental design and commences at that point that the need has been identified, resources have been allocated, and the program has been tentatively planned. The evaluator does not have to aid in program planning to evaluate the program.

Figure 5.0. Necessary Steps In Project Evaluation

5.1 Program Objectives Determination

5.1.1 Meet with decision makers and program managers to determine the program objectives.

5.1.2 Refine objectives through thorough analysis, review of literature, questioning decision makers, analysis of input data, etc.

5.2 Information Regarding Program Decisions

5.2.1 Using the objectives, meet with decision makers, etc. to generate a list of the critical decisions to be made concerning the objectives and the program.

5.2.2 Determine the types of information necessary to make the various decisions.

5.2.3 Estimate the critical decisions and plan the information sources so critical decisions receive the most information.

5.3 *Definition of Measurable Objectives and Related Decisions*

5.3.1 *Work with project personnel to mold objectives so that they may be measured.*

5.3.2 *Operationalize basis for decision-making to relate to measured achievement of objectives.*

5.4 *Plan of Evaluation Dissemination*

5.4.1 *Identify the various audiences of the evaluation report and estimate the level of sophistication of the intended audience.*

5.5 *Identification of Measuring Instruments*

5.5.1 *Review objectives and decisions and evaluate existing instruments to determine those which can be employed in the evaluation.*

5.5.2 *Determine areas where no satisfactory instruments are available and develop complete specifications of instruments that are to be constructed.*

5.6 *Instrument Development and Testing*

5.6.1 *Develop needed instruments.*

5.6.2 *Test new instruments, if necessary, on a sample of subjects.*

5.6.3 *Refine new instruments on the basis of these tests.*

5.6.4 *Test administration of any unconventional instruments or observation procedures.*

5.7 *Information Collection Scheduling*

5.7.1 *Specify sampling procedures to be employed.*

5.7.2 *Determine the schedule of observations and the instruments to be administered at each observation point.*

5.7.3 *Schedule the personnel needed to administer instruments.*

5.8 *Organization of Data Analysis*

5.8.1 *Determine various formats of data including card and tape format specifications at various stages of collection and analysis. Specify processing necessary to put data into correct format at each stage of analysis.*

5.8.2 Plan nonstatistical analysis of data and resources necessary to perform analysis.

5.8.3 Plan statistical analysis of data and programs necessary to analyze data.

5.8.4 Determine which programs are already written and are ready to use, which programs are written but need modifications to handle data in their intended formats, and which programs need to be written with specifications of these programs.

5.9 Formal Evaluation/Research Design

5.9.1 Prepare design including specification of

5.9.1.1 Objectives
5.9.1.2 Instrumentation
5.9.1.3 Analysis methodology
5.9.1.4 Data collection and reporting schedules
5.9.1.5 Sampling procedures
5.9.1.6 Data analyses schedules
5.9.1.7 Final reporting schedules

5.9.2 Type, print, and collate design.

5.9.3 Disseminate formal design.

5.10 Computer Program Development

5.10.1 Develop necessary programs for analysis.

5.10.2 Make necessary modification of existing programs.

5.10.3 Run all programs to be used on sample data in the proper medium and format. Construct sample data to simulate problems in actual data (mispunching, missing data, etc.).

5.11 Process Evaluation

5.11.1 Collect or supervise and coordinate collection of process evaluation information.

5.11.2 Prepare process evaluation information for analysis.

5.12 Product Evaluation

5.12.1 Collect or supervise and coordinate the collection of product evaluation information.

5.12.2 Prepare product evaluation information for analysis.

5.13 Interim Data Analysis

5.13.1 Organize interim data.
5.13.2 Perform analysis of interim data.

5.14 Formative Evaluation Reports

5.14.1 Prepare formative evaluation reports.
5.14.2 Type, print, and collate formative evaluation reports.
5.14.3 Disseminate formative evaluation reports to project management and staff.

5.15 Summative Data Analysis

5.15.1 Organize summative data.
5.15.2 Perform analysis of summative data.

5.16 Summative Evaluation/Research Reports

5.16.1 Prepare the various summative evaluation/research reports for each audience including objectives, findings, and recommendations expressed in an appropriate manner for the intended audience. This preparation includes the abstract of the report.
5.16.2 Have report carefully proofread and corrected.
5.16.3 Type, print, and collate the summative evaluation reports.
5.16.4 Disseminate the summative evaluation/research reports to project personnel, District management, and the Board of Education.

5.17 Interpretation of Reports

5.17.1 Meet with project personnel to interpret reports.
5.17.2 Meet with District management and the Board of Education to aid in report interpretation.

5.18 Further Report Dissemination

5.18.1 Disseminate summative evaluation/research reports to all affected District administrators and to interested professional staff.
5.18.2 Prepare and disseminate a book of evaluation and research abstracts to all professional staff.

5.19 Report Feedback

5.19.1 Meet with decision makers to obtain feedback regarding the report with the purpose of improving reporting activities.

Many evaluation systems stop at the provision of product evaluation information. These data generally bear upon the performance of different groups of students under varying treatment configurations. Unfortunately, as a result, most product evaluation reports have generally focused on the search for single best treatments for all learners, i.e., main effects. In order to provide needed information for educational decision makers, applied research studies involving the systematic investigation of aptitude-treatment and trait-trait interactions must be undertaken. Such studies would be expected to provide important information relative to replicable relationships between student, teacher, and program characteristics (Bracht, 1969; Cronbach and Snow, 1969; Salomon, 1972; Webster and Mendro, 1974b).

The basic assumption of aptitude-treatment interaction research is that learners possess characteristics or traits that interact positively or negatively with specific treatments or program characteristics. Messick (1970) outlined some cognitive style dimensions which represent a person's typical modes of perceiving, remembering, thinking, and problem solving, and, as such, would provide excellent variables for aptitude-treatment interaction studies. Figure 6.0 presents Messick's examples of these dimensions.

Figure 6.0. Examples of Cognitive Styles (Messick, 1970)

6.1 Field independence versus field dependence - "an analytical, in contrast to a global, way of perceiving (which) entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context" (Witkin et al., 1962).

6.2 Scanning - a dimension of individual differences in the extensiveness and intensity of attention deployment, leading to individual variations in vividness of experience and the span of awareness (Holzmann, 1966; Schlesinger, 1954; Gardner and Long, 1962).

6.3 Breadth of categorizing - consistent preferences for broad inclusiveness, as opposed to narrow exclusiveness, in establishing the acceptable range for specified categories (Pettigrew, 1958; Bruner and Tajfel, 1961; Kogan and Wallach, 1964).

6.4 Conceptualizing styles - individual differences in the tendency to categorize perceived similarities and differences among stimuli in terms of many differentiated concepts, which is a dimension called conceptual differentiation (Gardner and Schoen, 1962; Messick and Kogan, 1963), as well as consistencies in the utilization of particular conceptualizing approaches as bases for forming concepts - such as the routine use in concept formation of thematic or functional relations among stimuli as opposed to the analysis of descriptive attributes or the inference of class membership (Kagan, Moss, and Sigel, 1960; Kagan et al., 1963).

6.5 Cognitive complexity versus simplicity - individual differences in the tendency to construe the world, and particularly the world of social behavior, in a multidimensional and discriminating way (Kelly, 1955; Bieri, 1961; Bieri et al., 1966; Scott, 1963; Harvey, Hunt, and Schroder, 1961).

6.6 Reflectiveness versus impulsivity - individual consistencies in the speed with which hypotheses are selected and information processed, with impulsive subjects tending to offer the first answer that occurs to them, even though it is frequently incorrect, and reflective subjects tending to ponder various possibilities before deciding (Kagan et al., 1964; Kagan, 1965).

6.7 *Leveling versus sharpening - reliable individual variations in assimilation in memory. Subjects at the leveling extreme tend to blur similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience. Sharpeners, at the other extreme, are less prone to confuse similar objects and, by contrast, may even judge the present to be less similar to the past than is actually the case (Holzman, 1954; Holzman and Klein, 1954; Gardner et al., 1959).*

6.8 *Constricted versus flexible control - individual differences in susceptibility to distraction and cognitive interference (Klein, 1954; Gardner et al., 1959).*

6.9 *Tolerance for incongruous or unrealistic experiences - a dimension of differential willingness to accept perceptions at variance with conventional experience (Klein et al., 1962).*

In addition, there are many affective variables that warrant investigation when attempting to validate replicable teacher-student (trait-trait) interactions. The basic assumption of trait-trait interaction research is that teachers possess characteristics or traits that, independent of program, interact positively or negatively with specific characteristics or traits possessed by learners. Such interactions may involve variables such as arithmetic reasoning, language usage, vocabulary, abstract reasoning, mechanical reasoning, creativity, anxiety, affiliation, aggressiveness, compulsivity, dogmatism, paranoia, and status variables such as sex, age, or ethnicity (Webster and Mendro, 1974b).

Once context, input, process, and product evaluation information, as well as applied research data are available, non-research and evaluation information once more is brought to bear upon the

decision-making process. It would be naive to expect educational decisions to be made purely on the basis of research and evaluation data. Once again, information such as the absolute program costs, capabilities of program staff members, political feasibility of program implementation, and existing facilities and resources must be considered by decision makers in rendering a final decision.

In determining the fate of a given program, four primary choices are available to decision makers. First, they can choose to continue the program in its current setting. If this alternative is chosen, the summative product evaluation report and the applied research data become the context evaluation information for the next implementation phase, and program implementation commences. This alternative generally occurs when decisions are to be made on the basis of longitudinal studies, i.e., where it is expected that results will not be in evidence after a relatively short implementation period.

A second alternative is to discontinue the program. This is usually done after product evaluation studies demonstrate the failure of the program to meet its objectives or in those cases where the program is simply not cost-effective. (Failure to meet objectives is often a necessary, but not sufficient, condition for program discontinuation.) Once a program is discontinued, the system returns to context evaluation and once again applies the needs assessment and orientation phases.

If the product evaluation and applied research information are favorable, and it is practically and politically feasible, the program

may be expanded to serve additional students. Prior to making the decision to expand the program, additional context evaluation information must be examined to determine if similar needs exist in other settings. If such needs are demonstrated, then the program may be expanded to other settings and the program planning stage entered to extend the program implementation. Other settings eligible for program expansion may include entire schools or specific subpopulations (e.g., highly motivated students) as indicated by applied research data. If such needs do not exist, the program is continued with the original target population or a reduced target population based on the results of the applied research studies. The extent of continued evaluation to be implemented under either the expansion or continuation alternative is determined by decision makers under advisement from evaluation personnel.

A fourth alternative involves program revision. Much program revision should be accomplished on the basis of process and interim product evaluation reports. Often, however, summative product evaluation and applied research reports reveal weaknesses in portions of programs that would otherwise appear to be functional. In this instance, the summative product evaluation and applied research reports become the context evaluation information for the next program-planning cycle.

Figure 1.0 outlined a model for an operational research and evaluation system. However, data, no matter how comprehensive, are of limited use if not disseminated to decision makers. Figure 7.0

outlines the information requirements of decision makers at different management levels.

Figure 7.0. Information Requirements Of Various Management Levels That Should Be Met Through Systematic Research And Evaluation Programs (Webster and Mendro, 1974).

Management Levels	*Information Requirements*
Board of Education (Public)	*Product evaluation information (generally summative) on the effects of District projects and programs*
	Context evaluation information on the general state of the educational environment
Upper Management	*Product evaluation information (generally summative) on the effects of District projects and programs*
	Context evaluation on the general state of the educational environment
	Basic research information (mostly literature reviews) on selected fundamental relationships in learning
	Input evaluation information relative to alternative strategies for meeting specific needs
	Applied research information on the interactions between student characteristics, teacher characteristics, and program success in all District programs
Project Management	*Product evaluation information of a formative and summative nature on the effects of specific projects*
	Context evaluation information on the baseline state of the project environment

	Process evaluation information on a continuing basis relative to the extent of program implementation
	Applied research information on the interaction between student characteristics, teacher characteristics, and program success
	Basic research information on selected fundamental relationships in learning
Building Management	*Product evaluation information (generally summative) on the effects of District projects and programs*
	Context evaluation information on the general state of resident teachers and students and the sponsoring community
	Input evaluation information relative to alternative strategies for meeting specific needs
	Formative and summative product evaluation and applied research information on specific projects implemented in the building
Teachers	*Product evaluation information of a formative and summative nature on the effects of specific programs in which the teacher is involved*
	Context evaluation information relative to student entry level
	Process evaluation information on degree of program implementation for specific programs in which the teacher is involved
	Applied research information relative to the types of instructional strategies that are most effective with different learner characteristics and specific validated instruments and instructions for their use in student diagnosis
Parents/Students	*Feedback on individual student performance*

In order for research and evaluation information to be maximally effective, structured systems must be established to inject the empirical data into the decision-making process. This must be accomplished through the establishment at the local building and departmental level of zero-based budgetary planning models which systematically include research and evaluation data as part of the information needed for planning. At a higher level, there must be a method of supplying research and evaluation data to the Board of Education and public. In Dallas, the accountability function is performed through the Educational Program and Evaluation Committee of the Board of Education. Figure 8.0 outlines the functions of that Committee.

Figure 8.0. Functions Of The Educational Program and Evaluation Committee Of The Board Of Education

The primary missions of research and evaluation in the public schools are to provide accurate information in usable form to decision makers and to fulfill an accountability function. The Board of Education in its decision-making role relative to District goals, priorities, and policies will be a primary user of evaluation information. Additionally, the Board will have the responsibility for the definition of guidelines relative to its role in the utilization of program evaluation information. The following policies address this responsibility:

8.1 All educational program evaluation reports shall be submitted to the Board Educational Program and Evaluation Committee for study and recommendations to the Board of Education.

8.2 The Board of Education evaluates continuously and reports regularly to the public all activities of the Dallas Independent School District.

8.3 Only the Board of Education Educational Program and Evaluation Committee may release

educational program evaluation reports to individuals or agencies outside the Dallas Independent School District.

In order to define a systematic procedure by which evaluation reports may be brought to the attention of the Board, the following steps have been specified:

8.4 All educational program evaluation reports of the Dallas Independent School District will be forwarded to the executive officer in charge of the Development Division prior to their release to appropriate decision makers.

8.5 At the discretion of the executive officer in charge of the Development Division, the evaluation reports will be submitted to appropriate staff members for their suggestions concerning possible revisions.

8.6 The executive officer in charge of the Development Division will submit all educational program evaluation reports to the Educational Program and Evaluation Committee for their information and disposition.

As the Board Committee concerned with evaluation and, subsequently, the utilization of evaluation reports, functions of the Educational Program and Evaluation Committee of the Board of Education are relevant. These aforementioned functions are specified below:

8.7 Continuously assess and report to the Board the School District's needs for program evaluation information.

8.7.1 Monitor, review, and report to the Board program evaluation information as this information becomes available.

8.7.2 Identify and report to the Board unmet program evaluation information needs.

8.8 Identify alternatives and recommend priorities to the Board for providing needed evaluation information.

8.8.1 Assess the consequences of alternative approaches to providing needed evaluation information.

8.8.2 Report to the Board recommended priorities for providing needed program evaluation information.

8.9 Report to the Board recommended priorities for obtaining and utilizing funds and other resources in educational program evaluation.

8.9.1 Receive and review communications from outside institutions that provide funds and other resources for educational program evaluation.

8.9.2 Receive and review management recommendations regarding utilization of educational program evaluation resources.

8.10 Evaluate and report to the Board the School District's educational program evaluation effort.

8.10.1 Receive and review reports of all in-house and external educational evaluation, educational audit, and cost-effectiveness studies and reports.

8.10.2 Report to the Board the Committee's evaluation of the School District's educational program evaluation efforts.

Probably timeliness is the single most important factor in determining whether or not an evaluation report is useful. An evaluation report that is submitted after

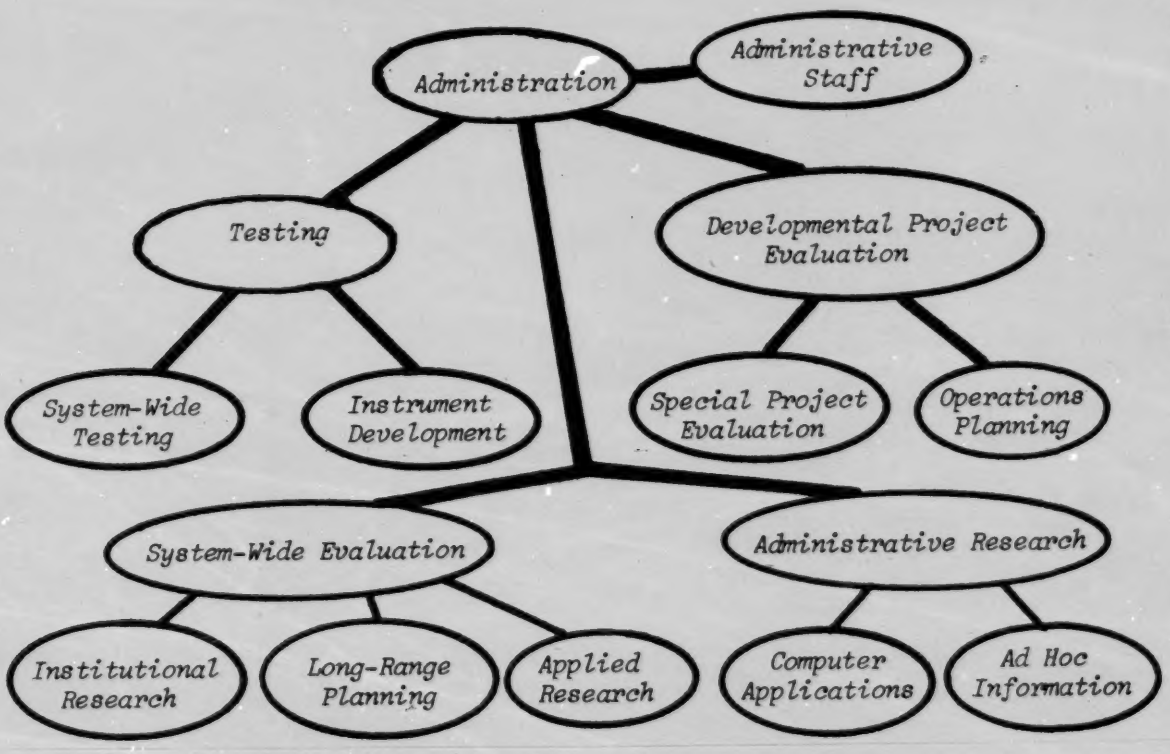
Since adequate time must be available to collect, analyze, and report data and an educational program must be given sufficient time to demonstrate an effect, the Dallas Independent School District has instituted a fifteen-month planning cycle. That is, an evaluation conducted during 1974-75 does not materially affect 1975-76 planning but, rather, feeds into the 1976-77 budget request that is prepared by December, 1975. This is true only of project evaluation, since all other types of evaluation can be legitimately completed early enough in the school year to allow their immediate use in decision-making. Since most project evaluations in Dallas are three-year

cumulative longitudinal designs, this planning approach often results in decisions being made on the basis of two-and-one-half years of data. This system allows for the production of quality evaluation and research reports that significantly affect educational decisions.

Organization

Figure 9.0 outlines the basic organization of a department designed to produce the types of information specified in Figure 7.0. The organizational chart is by function. Obviously, the size of any given branch would depend upon the breadth of information requirements of the Board of Education, Administration, and teaching staff that it services.

Figure 9.0. The Organization Of A Functional Research And Evaluation Unit



Administration

The Department of Research, Evaluation, and Information Systems is administered by technicians with management skills. Too often research organizations in applied settings are administered by non-technicians who at times underestimate the scope of requested services, thus overcommitting resources and failing to meet deadlines, and who must rely on subordinates to hire competent personnel. Since it is very difficult for nontechnical administrators to hire technical staff, and since the quality of an evaluation effort is almost completely dependent upon the ability and committment of the evaluation staff, it behooves chief administrators in applied settings to hire research managers trained in the basic skills of systematic inquiry to head research departments.

The administration branch has major responsibility for the management of all research and evaluation programs being implemented in the District. Members of this branch participate in the design, interpretation, report-writing, and dissemination phases of all major evaluation efforts and consult with District decision makers and the Board of Education. They procure and allocate resources, assign priorities, and make decisions concerning the validity of research and evaluation designs, testing, statistical applications to questions in the behavioral science domain, process and product evaluation methodology, measurement strategies, and data interpretation and analysis. The administrative group must broker the politics of the system in such a manner that the independence of project and program

evaluators is assured and objective data from systematic, controlled research and evaluation studies are injected into the decision-making process.

The administrative team consists of the department head, an administrative assistant to the department head, a senior technical assistant to the department head, and four heads of the four branches of the department (Testing, System-Wide Evaluation, Developmental Project Evaluation, and Administrative Research). Figure 10.0 outlines the optimal competencies for each member of the administrative team. These competencies are listed in their entirety in the Appendix. Close scrutiny of the competencies will shed light on the functions of each of the positions, since only those competencies that contribute to optimal functioning are listed. Actual job descriptions list minimal and optimal competencies. Minimal competencies are a subset of the optimal competencies.

*Figure 10.0. Optimal Competencies For Research Management Personnel**

Department Head	*1, 2, 3, 6, 16, 19, 22, 23, 24, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 45, 46, 49, 50, 51, 52, 55, 57, 58, 59, 62, 63, 64, 65, 67. 68, 69, 70, 76, 80, 85, 91, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 113, 114, 116, 117, 123, 124, 125, 126, 127, 128, 129, 130, 132, 133, 134, 135, 136, 137, 138, 141, 142, 143, 144, 145, 146, 152, 154, 155, 156, 158, 159, 160, 161, 162, 163, 164, 165, 166, 169, 170, 171, 172, 173, 174, 175.*
Senior Technical Assistant	*1, 2, 3, 6, 7, 10, 16, 17, 18, 19, 24, 29, 30, 31, 32, 33, 34, 35, 36, 45, 46, 49, 50, 51, 52, 57, 58, 59, 60, 63, 64, 65, 67, 70, 71, 73, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 98, 100, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 113, 114, 116, 117, 122, 123.*

**The competencies listed are those required to function optimally in the positions specified.*

Senior Technical Assistant (cont.)	*124, 126, 127, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 165, 166.*
Administrative Assistant	*1, 2, 3, 6, 9, 12, 13, 16, 19, 20, 21, 22, 24, 27, 33, 45, 63, 65, 67, 68, 69, 76, 91, 98, 99, 100, 103, 104, 105, 106, 107, 125, 128, 129, 130, 132, 134, 161, 163, 164, 165, 167, 168, 172, 173, 174, 175.*
Director - Testing	*1, 2, 3, 6, 16, 19, 22, 23, 24, 27, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 45, 46, 49, 50, 51, 52, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 76, 80, 85, 91, 98, 100, 102, 103, 104, 105, 106, 107, 110, 113, 116, 117, 127, 128, 130, 132, 134, 135, 136, 137, 138, 141, 145, 146, 154, 156, 158, 159, 160, 161, 162, 163, 164, 165, 166, 169, 170, 171, 173, 174.*
Director - System-Wide Evaluation	*1, 2, 3, 6, 7, 10, 16, 17, 18, 19, 22, 23, 24, 26, 27, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 45, 46, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 61, 63, 64, 65, 67, 68, 69, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 98, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 113, 116, 117, 122, 123, 124, 125, 126, 127, 128, 130, 132, 133, 134, 135, 136, 137, 138, 139, 140 141, 144, 145, 146, 147, 148, 149, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 169, 170, 171, 173, 174.*
Director - Developmental Project Evaluation	*1, 2, 3, 6, 10, 16, 19, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 45, 46, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 60, 63, 64, 65, 67, 68, 69, 70, 76, 77, 78, 80, 85, 91, 98, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 141, 142, 143, 145, 146, 151, 152, 154, 155, 156, 158, 159, 160, 161, 162, 163, 164, 165, 166, 169, 170, 171, 173, 174.*

Director - Administrative Research	*1, 2, 3, 6, 7, 10, 16, 17, 18, 19, 23, 24, 26, 27, 32, 33, 35, 36, 37, 38, 39, 40, 45, 46, 49, 50, 51, 52, 55, 56, 57, 63, 64, 65, 67, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 96, 98, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 113, 116, 123, 124, 126, 127, 128, 130, 131, 132, 134, 135, 136, 137, 138, 139, 140, 141, 145, 146, 152, 155, 156, 158, 160, 161, 162, 163, 164, 165, 166, 169, 170, 171, 173, 174.*
Assistants - Administration	*2, 3, 5, 6, 7, 9, 10, 14, 16, 19, 20, 21, 24, 41, 42, 43, 44, 45, 46, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 85, 98, 99, 100, 101, 103, 104, 105, 106, 107, 109, 113, 116, 123, 124, 128, 129, 130, 132, 134, 165.*
Support - Administration	*2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 19, 56, 74, 75.*

In addition to those positions specified above, a number of specialized administrative personnel must be retained by a large research and evaluation department. These are not decision makers but rather support personnel. Two important examples include an editor and a production controller (in charge of producing the reports).

Perusal of Figure 10.0 suggests that the senior technical assistant is a technician while the administrative assistant actually helps in the daily routine management of the department. The senior technical assistant functions as the quality control officer as well as aids the department head in many daily tasks. He is responsible for assuring the accuracy and objectivity of all evaluation and research reports. Reports are reviewed, data collection and analysis procedures verified, and results certified. External auditors have

occasionally been employed for this purpose, however, due to their general inability to become sufficiently familiar with applied evaluation problems and methodology in specific settings, have been of limited utility. The senior technical assistant is charged with the responsibility of keeping abreast with the latest trends and developments in evaluation, research, measurement, and statistical methodology, and is drawn from the ranks of the best evaluators in the department.

Testing

The testing branch must have the capability to plan and implement a large-scale testing program as well as to develop and validate criterion-referenced tests and other specialized instruments. It functions as a service branch to other branches of the department in developing instruments for use in applied research and program evaluation applications. It must maintain an active file on available instruments so that much duplication in instrument development can be avoided.

The System-Wide Testing office has major responsibility for the development and implementation of policies and procedures concerning the collection, quality control, availability, and utilization of group system-wide testing data. It formulates new strategies for measuring and reporting student aptitude and achievement, keeps abreast of the literature in measurement and testing, and communicates with the principals and building test coordinators relative to testing procedures and interpretation.

The Instrument Development and Validation office has major responsibility for the development and validation, in conjunction with subject-area consultants and research and evaluation user personnel, of criterion-referenced tests and affective instruments. An active instrument file is maintained by this office. Figure 11.0 outlines the optimal competencies of personnel in the various testing offices.

*Figure 11.0. Optimal Competencies For Testing Personnel**

Senior Staff - System-Wide Testing	*1, 2, 3, 6, 7, 10, 16, 19, 22, 23, 24, 26, 27, 32, 33, 35, 36, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67. 68, 69, 70, 71. 72. 73, 76, 77, 80, 85, 91, 98, 100, 102, 103, 104, 105, 106, 107, 110, 113, 116, 117, 127, 132, 134, 135, 136, 137, 138, 141, 145, 146, 156, 158, 160, 161, 162, 165, 166.*
Assistants - System-Wide Testing	*2, 3, 5, 6, 7, 9, 10, 13, 14, 16, 19, 22, 23, 24, 41, 42, 43, 44, 45, 46, 55, 56, 57, 58, 59, 63, 65, 66, 67, 68, 69, 70, 72, 74, 75, 76, 77, 85, 98, 100, 103, 104, 105, 106, 107, 113, 116, 134, 165.*
Senior Staff - Instrument Development	*1, 2, 3, 6, 7, 10, 16, 19, 22, 23, 24, 26, 27, 32, 33, 35, 36, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 76, 77, 78, 85, 91, 98, 100, 102, 103, 104, 105, 106, 107, 110, 113, 116, 117, 119, 132, 134, 135, 136, 137, 138, 141, 145, 146, 156, 158, 160, 161, 162, 165, 166.*
Assistants - Instrument Development	*2, 3, 5, 6, 7, 9, 10, 13, 14, 16, 19, 23, 24, 41, 42, 43, 44, 45, 46, 47, 48, 55, 56, 57, 58, 59, 60, 63, 65, 66, 67, 68, 69, 70, 72, 74, 75, 76, 77, 85, 98, 100, 103, 104, 105, 106, 107, 113, 116, 134, 165.*
Support - Testing	*2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 19, 41, 56, 74, 75.*

**The competencies listed are those required to function optimally in the positions specified.*

Management: *In situations where individuals are charged with the management of subunits, competencies 163, 164, and 170 also apply.*

System-Wide Evaluation

The System-Wide Evaluation branch is responsible for all longitudinal and cross-sectional system-wide planning, research, and evaluation programs. It operates through three offices: Institutional Research, Long-Range Planning, and Applied Research.

The Institutional Research office is responsible for the design and implementation of studies that utilize the District's various longitudinal data bases. The various types of studies conducted by this office were outlined in Figure 2.0. Such studies require a sophisticated knowledge of data processing and multivariate statistics as well as research techniques developed through disciplines other than psychology and education (e.g., path analysis).

The Long-Range Planning office is charged with the responsibility of developing computerized simulation models designed to improve the information base from which decisions are made. It is the purpose of these models to predict the outcome of policy and/or environmental changes prior to the implementation of these changes and thus bring data to bear upon the operationalization of future-oriented decisions. General areas of focus were outlined in Figure 3.0.

The Office of Applied Research is responsible for the systematic investigation of individual differences in learning. It develops and utilizes strategies for investigating interactions among student, teacher, and treatment configurations that produce optimal student

learning. This office also coordinates university research within the District and issues requests for proposals to investigate specific problem areas. The key to the success of this type of endeavor would seem to be a systematic longitudinal program of mutually supporting studies designed to investigate concomitants of individual differences in learning. Figure 12.0 outlines the competencies required of personnel in the various system-wide evaluation offices.

*Figure 12.0. Optimal Competencies For System-Wide Evaluation Personnel**

Senior Staff - Institutional Research	*1, 2, 3, 6, 7, 10, 16, 19, 23, 24, 26, 27, 30, 32, 33, 35, 36, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 61, 63, 64, 65, 67, 68, 70, 76, 77, 78, 80, 82, 83, 84, 85, 87, 88, 90, 91, 95, 98, 100, 102, 103, 104, 105, 106, 107, 108, 109, 110, 113, 116, 117, 126, 127, 134, 135, 136, 137, 138, 141, 145, 146, 152, 155, 156, 158, 159, 160, 161, 162, 165, 166.*
Assistants - Institutional Research	*2, 3, 5, 6, 7, 10, 14, 16, 19, 24, 41, 42, 43, 44, 45, 46, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 85, 91, 98, 100, 103, 104, 105, 106, 107, 109, 113, 116, 132, 134, 165.*
Senior Staff - Long-Range Planning	*1, 2, 3, 6, 7, 10, 16, 19, 24, 26, 30, 32, 33, 35, 36, 38, 55, 56, 57, 63, 64, 76, 77, 78, 79, 80, 82, 83, 84, 85, 89, 90, 91, 92, 93, 96, 97, 98, 99, 100, 102, 103, 104, 106, 107, 108, 109, 110, 113, 116, 123, 124, 125, 126, 127, 128, 135, 136, 137, 138, 139, 140, 141, 145, 148, 149, 150, 151, 152, 153, 157, 160, 161, 162, 165, 166.*
Assistants - Long-Range Planning	*2, 3, 5, 6, 7, 10, 16, 19, 24, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 79, 85, 91, 98, 99, 100, 103, 104, 106, 107, 116, 123, 124, 125, 126, 134, 165.*

Senior Staff - Applied-Research	*1, 2, 3, 6, 7, 10, 16, 19, 24, 26, 27, 31, 32, 33, 35, 36, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 63, 64, 65, 67, 70, 71, 76, 77, 80, 85, 91, 98, 100, 101, 102, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 116, 117, 118, 119, 120, 121, 122, 131, 132, 134, 135, 136, 137, 138, 141, 144, 145, 146, 147, 156, 158, 160, 161, 162, 165, 166.*
Assistants - Applied Research	*2, 3, 5, 6, 7, 10, 14, 16, 19, 24, 41, 42, 43, 44, 45, 46, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 85, 98, 100, 101, 103, 104, 105, 106, 107, 113, 116, 117, 132, 134, 165.*
Support - System-Wide Evaluation	*2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 19, 56, 74, 75.*
Management:	*In situations where individuals are charged with the management of subunits, competencies 163, 164, and 170 also apply.*

**The competencies listed are those required to function optimally in the positions specified.*

Developmental Project Evaluation

The Developmental Project Evaluation Branch has major responsibility for most of the input, process, and product evaluation that is implemented. It operates through two offices, Special Project Evaluation and Operations Planning.

The Special Project Evaluation office is responsible for the evaluation of those special projects which receive highest priority for evaluation from District decision makers. Major activities of this office include the formulation and implementation of detailed evaluation designs, the design of specialized instruments (in conjunction with the Office of Instrument Development and Validation), process evaluation, interim reporting of process and product evaluation results to project managers, data analysis, and the preparation

and reporting of final evaluation reports (see Figure 5,0). In addition, this office provides support for program development (see Figure 4.0).

Formal evaluation designs are completed for all projects. Figure 13.0 outlines the types of questions that are asked to determine whether or not a given evaluation design is adequate.

Figure 13.0. Criteria For Judging Evaluation Designs

13.1 Are the objectives of the program adequately stated?

13.2 Are the decision situations to be served adequately defined?

13.3 Are the evaluation questions of interest adequately delineated and do they adhere to the decision situations to be served?

13.4 Are the data to be collected adequately specified and do they match the evaluation questions of interest? Are all questions adequately investigated?

13.5 Are the relevant populations and sampling procedures for data collection adequately described? Is there reason to believe that the experimental and control groups are comparable?

13.6 Are the instruments for data collection adequately described? Are they related to the objectives of the program? Are they valid and reliable for the population being studied?

13.7 Are schedules specified for information collection? Are they realistic?

13.8 Are formats and means for coding, organizing, storing, and retrieving data specified?

13.9 Are means of observing and documenting unanticipated outcomes available?

13.10 Are data analysis procedures specified? Are the analysis procedures specified appropriate for providing useful information relative to achievement of the objectives of the program and the research questions of interest?

13.11 Is the evaluation schedule present and, given staff and resource availability, is it realistic?

13.12 Is the evaluation design likely to provide useful (i.e., valid, reliable, objective) information?

13.13 Are there provisions made for process evaluation (i.e., for observing the project in operation) to determine whether or not it is functioning according to specifications?

13.14 Are there provisions made for adequate interim evaluation?

13.15 Is a schedule specified for reporting relevant information to specified decision makers? Is the schedule realistic?

13.16 Is the budget adequate to carry out the proposed evaluation?

Designs are generally longitudinal and include both longitudinal and cross-sectional comparison groups.

The Special Project Evaluation office is the largest of the offices. It includes the evaluation of all federally funded projects, as well as all special projects (e.g., special education, bilingual education, etc.), and is composed of many subgroups that account for approximately thirty-five percent of the budget. Since the Department of Research, Evaluation, and Information Systems fulfills an accountability function, care must be taken to ensure objective evaluation. Therefore, all project evaluation personnel, regardless of their assignments, are members of the central research and evaluation staff. Their continued employment is not contingent upon continued funding of the particular project or projects to which they are assigned. Experience suggests that this arrangement

leads to increased objectivity on the part of evaluators and incorporates many of the benefits thought to accrue from both external and internal evaluation. Figure 14.0 outlines the District's guidelines for project evaluation.

Figure 14.0. Guidelines For Project Evaluation

Recognizing the need to ensure the credibility of evaluation reports, all project evaluation staff assigned to projects which the Department of Research, Evaluation, and Information Systems has the responsibility for evaluating will be directly responsible to the executive officer of the Department of Research, Evaluation and Information Systems. In addition to ensuring the credibility of evaluation reports, central control of evaluation personnel will allow for the most efficient use of human resources. Thus, evaluation personnel, regardless of location, will be staff members of the Research, Evaluation, and Information Systems Department and as such, subject to the following conditions:

14.1 Dissemination and Utilization of Evaluation Information

14.1.1 Availability of evaluation information, prior to its formal presentation to the Board of Education, will be limited to those individuals who have an established need to know. Normally, this would include project officials, as well as the evaluation personnel associated with the project.

14.1.2 The proprietary nature of evaluation information must be respected. The proper functions of evaluation are to provide continuous feedback to project officials and to furnish relevant information to District decision makers.

14.1.3 All individuals who have access to evaluation information must be cognizant of its proper functions and of ethical considerations applying to the misuse of such information. Evaluation personnel, particularly, are expected to process information in accord with responsible reporting procedures.

14.2 *Scope of Work*

14.2.1 *What to evaluate, when to evaluate, and how to evaluate will be determined by personnel from Research and Evaluation in consultation with those charged with the responsibility for making decisions about the operation of the project.*

14.2.2 *Assignment of duties for evaluation personnel shall be made by the executive officer of the Department of Research, Evaluation, and Information Systems or his designee.*

14.2.3 *All evaluation reports will be delivered simultaneously to the project manager and the executive officer of the Department of Research, Evaluation, and Information Systems. The executive officer of the Department of Research, Evaluation, and Information Systems will then forward evaluation reports to the executive officer of the Development Division, for presentation to the Educational Program and Evaluation Committee of the Board of Education.*

14.3 *Employment*

14.3.1 *All evaluation personnel will be recommended for employment, promotion, change of project, or termination of employment by the executive officer of the Department of Research, Evaluation, and Information Systems after consultation with the Project Director.*

14.3.2 *The executive officer of the Department of Research, Evaluation, and Information Systems will recommend placement of all personnel.*

14.3.3 *Terms of employment will be the same as comparable central office positions. The employment security of evaluation personnel assigned to projects will not be dependent upon the continued implementation of specific projects to which they may be assigned.*

14.3.4 *All leaves of absence and vacations will be subject to approval by the executive officer of the Department of Research, Evaluation, and Information Systems.*

14.4 Local Regulations and Negotiations

14.4.1 All evaluators placed in locations other than the Central Administration Building shall be subject to the same rules and regulations as other administrators in that location, with the exception of those items specified under Sections 14.2 and 14.3 above.

14.4.2 All disagreements relative to the functions of project evaluation personnel will be negotiated by the executive officer of the Department of Research, Evaluation, and Information Systems and personnel responsible for making decisions relative to the project.

The Operations Planning Office is responsible for providing technical assistance to project managers in planning their projects and to top decision makers in utilizing data to make important decisions. In addition, this office provides the input evaluation function. Operations Planning is currently developing several planning models designed to help focus available data at the local school level to aid principals in planning their programs. Figure 15.0 outlines the optimal competencies for personnel in each of the two offices of Developmental Project Evaluation.

*Figure 15.0. Optimal Competencies For Developmental Project Evaluation Personnel**

Senior Staff - Special Project Evaluation	*1, 2, 3, 6, 7, 10, 16, 19, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 38, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 63, 64, 65, 67, 70, 76, 77, 80, 85, 91,98, 100, 101, 102, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, 115, 116, 117, 126, 127, 131, 132, 134, 135, 136, 137, 138, 141, 142, 143, 145, 146, 152, 156, 158, 160, 161, 162, 165, 166.*

*The competencies listed are those required to function optimally in the positions specified.

Assistants - Special Project Evaluation	*2, 3, 5, 6, 7, 10, 16, 19, 22, 23, 24, 25, 28, 41, 42, 43, 44, 45, 46, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 85, 98, 100, 101, 103, 104, 105, 106, 107, 109, 113, 114, 116, 134, 143, 145, 146, 165.*
Senior Staff - Operations Planning	*1, 2, 3, 6, 16, 19, 24, 25, 26, 27, 28, 32, 33, 35, 36, 38, 45, 46, 47, 48, 55, 56, 57, 63, 64, 65, 67, 91, 98, 99, 100, 101, 102, 103, 104, 106, 107, 108, 109, 110, 113, 114, 116, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 134, 135, 138, 139, 140, 141, 151, 160, 161, 162, 165, 166.*
Assistants - Operations Planning	*2, 3, 6, 16, 19, 22, 24, 25, 38, 45, 47, 48, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 98, 99, 100, 103, 104, 106, 107, 109, 113, 116, 123, 125, 128, 129, 130, 134, 165.*
Support - Developmental Project Evaluation	*2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 19, 56, 74, 75.*
Management:	*In situations where individuals are charged with the management of subunits, competencies 163, 164, and 170 also apply.*

Administrative Research

The Administrative Research Branch has major responsibility for responding to the ad hoc needs of District decision makers and for providing computer services to the other branches of the Department. It operates through the Ad Hoc Research and Computer Applications offices.

No operating research department can survive in an applied setting without an Office of Ad Hoc Research. If such an office does not exist, then the work of the entire department is constantly impacted by the ad hoc information requirements of decision makers. This office is charged with the responsibility of conducting research

and evaluation studies to meet immediate information demands. In addition, personnel from this office provide technical assistance in evaluation and research design and interpretation to District personnel, and write the technical sections of many District proposals.

The Computer Applications office maintains a longitudinal student, staff, and community data base, develops and maintains a library of statistical analysis programs, provides the majority of interface with the District's Data Processing Department, and provides technical assistance to practicing evaluators in the analysis of their data. The most important task of this office is the maintenance of a longitudinal data base. Figure 16.0 outlines some major categories of information that are included in the data base.

Figure 16.0. Major Categories Of Information

Student

* *permanent student number*
* *name*
* *school number(s)*
* *sex*
* *ethnic background*
* *birthdate*
* *absences*
* *dropout and withdrawal information*
* *enrollment in special programs*
* *raw scores on all system-wide tests*
* *vocational interest areas*

* *course numbers of courses taken, grades 7-12*
* *grades in courses taken, grades 7-12*
* *participation in extra-curricular activities, grades 7-12*
* *head of household*
* *highest educational level of head of household*
* *vocational field of head of household*
* *discipline record (suspensions, etc.)*
* *one-year follow-up information (a sample)*
* *five-year follow-up information (a sample)*

Teacher

* *social security number*
* *name*
* *school number(s)*
* *sex*
* *ethnic background*
* *birthdate*
* *teaching experience*
* *degree(s)*
* *institution(s) granting degree(s)*
* *raw scores on available achievement tests*
* *course numbers of courses taught*
* *absences*

School

* *lowest grade*
* *highest grade*
* *total enrollment by sex and ethnic background within grade*
* *instructional expenditures by category*
* *socioeconomic status of community*
* *age, size, and physical condition of facility*

All other necessary data are collected for specific studies through random sampling procedures. Figure 17.0 outlines the optimal com-

petencies for personnel in each of the two offices of Administrative Research.

*Figure 17.0. Optimal Competencies For Administrative Research Personnel**

Senior Staff - Ad Hoc Research	*1, 2, 3, 6, 7, 10, 16, 19, 24, 26, 27, 32, 33, 35, 36, 38, 45, 46, 49, 50, 51, 52, 55, 56, 57, 63, 64, 65, 67, 76, 77, 78, 80, 82, 83, 84, 85, 91, 98, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 113, 116, 126, 127, 131, 132, 134, 135, 136, 137, 138, 141, 145, 146, 152, 155, 156, 158, 160, 161, 162, 165, 166.*
Assistants - Ad Hoc Research	*2, 3, 5, 6, 7, 10, 16, 19, 24, 41, 42, 43, 44, 45, 46, 55, 56, 57, 63, 65, 67, 74, 75, 76, 77, 85, 98, 100, 101, 103, 104, 105, 106, 107, 109, 113, 116, 134, 145. 146, 165.*
Senior Staff - Computer Applications	*1, 2, 3, 5, 6, 7, 10, 16, 17, 18, 19, 24, 33, 58, 59, 60, 61, 63, 64, 65, 67, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 102, 103, 104, 106, 110, 113, 123, 124, 126, 127, 134, 135, 136, 137, 138, 139, 140, 141, 161, 162, 165, 166.*
Assistants - Computer Applications	*2, 3, 5, 6, 7, 10, 16, 17, 18, 19, 24, 63, 65, 67, 74, 75, 76, 77, 78, 80, 82, 83, 84, 85, 87, 89, 90, 91, 92, 94, 103, 123, 124, 165.*
Support - Administrative Research	*2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 56, 74, 75, 76, 77.*
Management:	*In situations where individuals are charged with the management of subunits, competencies 163, 164, and 170 also apply.*

**The competencies listed are those required to optimally function in the positions specified.*

Required Resources

Research and evaluation is not inexpensive, but, when used correctly, is cost-effective. If the information obtained from systematic research

and evaluation studies is used prudently by decision makers, it can save millions of dollars investment in ineffective programs and contribute substantially to improving the education of children. Thus, the major resource required for the implementation of a research and evaluation strategy similar to the one outlined in this paper is top-level management who are committed to utilizing objective data as a major input to educational decisions. If top-level management is not so inclined, any research and evaluation effort is destined to be noncost-effective and impotent.

Beyond committment of top-level management to data-based decision-making, a competent research and evaluation staff is essential. Staff members must possess considerable expertise in measurement, mathematical statistics, research and evaluation methodology, computer programming, data processing and analysis, and report generation; and be willing to fill the difficult role of change agent. Useful evaluation requires controlled studies that can only be implemented by competent methodologists functioning independently in applied settings.

On a more technical basis, a systematic testing program including both standardized and criterion-referenced instruments and sufficient computer time and facilities to maintain the requisite data bases and to permit the accomplishment of considerable data analysis are essential. Without control of data sources and data processing capability, the system would fail to produce the timely, reliable information that all such service departments must produce to survive.

The type of service described in this paper can be supplied to most large school districts (> 50,000 students) for approximately two percent of their operating budget. That two percent plus an additional two percent for development would provide education with a renewal system that could begin to solve systematically some of schooling's difficult problems.

The establishment of effective research and evaluation systems in the public schools is essential for educational renewal. To assume that public school systems should be passive recipients of externally developed products, often unaccompanied by sufficient empirical evidence of success or accompanied by empirical support based on restricted student or teacher populations, is ludicrous. Often adjustments must be made in externally developed programs to meet local requirements, or, where externally developed programs do not exist, strategies must be locally developed for meeting specific needs. Evaluation, in the absence of applied and basic research data, is not capable of providing the necessary information for meeting the needs of diverse student populations.

Required Competencies for Planning,
Research, and Evaluation Personnel

General

1. Demonstrates a commitment to the empirical approach to problem-solving. Draws conclusions on the basis of data rather than opinion.

2. Can clearly and concisely communicate information in written form.

3. Can clearly and concisely communicate information in verbal form.

Support

4. Can operate transcribing machine.

5. Can operate keypunch machine.

6. Can operate electronic calculator.

7. Can operate sorter.

8. Can type and proofread technical reports in a rapid and professional manner.

9. Can set up and maintain a numerical or alphabetical filing system.

10. Can operate a time-sharing terminal.

11. Can operate a PBX Console.

12. Can operate copying machines.

13. Can demonstrate a knowledge of inventory control methods.

14. Can utilize Post Office weighing scales.

15. Can operate a Mag Card II typewriter.

16. Can read and understand writing style manuals and quality control technical reports to ensure that they follow the accepted formats.

17. Can operate a remote job entry terminal.

18. Can operate a digital computer.

19. Can interpret and implement written and verbal instructions in a manner necessary to expedite assigned tasks.

20. Can administer a line-item budget in such a manner so as to ensure that proper expenditure of funds from many diverse funding sources is expedited and that all departmental bills on received merchandise and maintenance are paid.

21. Can read, understand, complete, and, when necessary, interact with other departments relative to the myriad of special procedures plus supply and personnel forms required to function in a large bureaucracy.

Communications

22. Can interact with classroom teachers and principals to explain the purpose and importance of process evaluation in providing useful information to decision makers.

23. Can interpret standardized test results to professional educators, parents, and students.

24. Can articulate the purpose of planning, research, and evaluation functions in an applied setting. This would require the ability to articulate to non-research and evaluation personnel the purposes of and interrelationships among context, input, process and product evaluation, applied and basic research.

25. Can provide assistance to program management in establishing program objectives and implementation plans.

26. Can anticipate decisions to be served by a planning, research, or evaluation study and design that study to provide information relevant to those decisions.

27. Can articulate the problems of the building principal and classroom teacher and provide sufficient lead time to allow for necessary intervention in the school environment.

28. Can interact with project management to ensure optimal usefulness of project evaluation information.

29. Can communicate the results of project evaluation to project management (this includes differential media utilization).

30. Can communicate the results of program evaluation to District management (this includes differential media utilization).

31. Can communicate the results of basic research to District management (this includes differential media utilization).

32. Can write both technical and popularized versions of planning, research, or evaluation reports, without oversimplifying the popularized version.

33. Can effectively exercise judgment in providing evaluation information to various levels of District employees and the public.

34. Can effectively communicate with District auditors and other non-District professional personnel relative to design, measurement, data processing, and reporting considerations.

35. Can communicate findings from planning, research, and evaluation studies in such a manner that professional educators and policy-makers can use the information in making and implementing decisions.

36. Can summarize and interpret planning, research, and evaluation literature from other agencies and organizations in such a manner as is useful to District decision makers in planning the future course of education for District students.

37. Can communicate effectively with policy groups such as teacher associations and boards of education concerning the need for and nature of planning, research, and evaluation systems.

38. Can work effectively in planning tasks with all levels of management.

39. Can provide valid inputs to decision makers at all levels in setting priorities for the collection and reporting of evaluation information.

40. Can communicate the effects of District projects and programs to the mass media and to the public.

Instrument Construction, Selection, and Implementation

41. Given a set of specifications, can write forced-choice and free-choice test items.

42. Given a set of specifications, can develop instruments to measure specific behaviors. These behaviors may be in the affective or cognitive domain.

43. Given a set of specifications, can design a classroom observation instrument.

44. Given a set of specifications, can design an interview instrument.

45. Given an instrument, can conduct an interview.

46. Can use reference sources such as Buros' Mental Measurement Yearbook to aid in the selection of standardized instruments.

47. Can write operational objectives at each level of the cognitive taxonomy and specify attainment criteria associated with them.

48. Can write operational objectives at each level of the affective taxonomy and specify attainment criteria associated with them.

49. Can develop specifications for instruments designed to measure specific behaviors. These behaviors can be in the cognitive or affective domain.

50. Can develop specifications for the design of a classroom observation instrument.

51. Can develop specifications for the design of an interview instrument.

52. Can develop specifications for and implement the training of interviewers.

53. Can design and implement a classroom observation schedule for purposes of process evaluation.

54. Can develop specifications for and implement the training of process evaluators.

55. Can establish data collection schedules dealing with tests, classroom observation, questionnaires, and interviews.

56. Can implement data collection schedules dealing with tests, classroom observation, questionnaires, and interviews.

57. Can monitor data collection schedules dealing with tests, classroom observation, questionnaires, and interviews.

58. Can explain the standard procedures that should be employed when norming a test.

59. Can perform an item analysis and interpret the results.

60. Can design and perform an instrument validation study and interpret the results.

61. Can norm a test.

62. Can establish and implement a system-wide testing program incorporating management concepts that permit continuous monitoring and updating of that program.

Measurement

63. Can read and understand relevant portions of basic measurement texts. Such texts are on the level of Cronbach (1970), Helmstadter (1964), Nunnally (1959), and Bracht, Hopkins, & Stanley (1972). (This implies an understanding of the topics included in such texts.)

64. Can read and understand relevant portions of intermediate measurement texts. Such texts are on the level of Gulliksen (1950), Horst (1966), Lindquist (1951), Torgerson (1958), and Whitla (1968). (This implies an understanding of the topics included in such texts.)

65. Can demonstrate a general understanding of the concept of reliability.

66. Can compare and constrast the different methods of estimating instrument reliability.

67. Can demonstrate an understanding of the concept of validity and distinguish among content, concurrent, predictive, and construct validity.

68. Can discuss the assumptions underlying the interpretation of norm-referenced tests.

69. Can describe the use and limitations of standardized tests for placement, diagnostic, and evaluative purposes, and relate them to crucial issues in testing.

70. Can compare and constrast the objectives and procedures of criterion-referenced versus norm-referenced measurement.

71. Can discuss the assumptions underlying major scaling techniques, e.g., subjective estimate, fractionation, equisection, differential sensitivity.

72. Can compare and contrast the different approaches to estimating the different types of instrument validity.

73. Can discuss critically emergent developments in the field of educational measurement.

Computer Skills

74. Can prepare data for analysis either via cardpunch or remote terminal given format specifications and instructions.

75. Can code data for preparation given instructions and appropriate coding scheme.

76. Can devise a coding scheme for a given set of data and arrange the data and data collection process in such a way as to make implementation of the coding scheme practical.

77. Can run existing programs, including preparation of all control cards, from either batch processing or time-sharing modes given proper instructions.

78. Writes fluently in a standard applications language (e.g., COBOL, FORTRAN).

79. Is familiar with the nature and function of operating systems; understands the relationship between operating systems and applications programs.

80. Understands the characteristics of common storage media (e.g., punched cards, magnetic tape, disk). Can analyze a data storage application in terms of the advantages and limitations of the various media.

81. Is conversant with the technical vocabulary of data processing. Understands, for example, such terms as register, stock, flip-flops, masking, interrupt.

82. Can write programs in ALGOL and/or FORTRAN to perform basic statistical calculations on relatively small sets of data. Statistical calculations include finding means, standard deviations, variances, medians, modes, and zero-order correlation matrices.

83. Can write efficient programs for processing large data files given appropriate specifications.

84. Has some understanding of basic terms and concepts, including such constructs as logical record, random-access, microsecond, hexadecimal.

85. Can accurately state requirements for a data processing problem. This involves the ability to specify without ambiguity the input and desired output.

86. Has sufficient overall knowledge to make intelligent recommendations concerning equipment and configuration.

87. Given specifications can write programs in ALGOL and/or FORTRAN to perform common parametric and nonparametric statistical tests including t-test, analysis of variance, analysis of covariance, multiple regression analysis, chi-square contingency analysis, and goodness-of-fit tests.

88. Can provide specifications for the writing of programs in ALGOL and/or FORTRAN to perform common parametric and nonparametric statistical tests including t-test, analysis of variance, analysis of covariance, multiple regression analysis, chi-square contingency analysis, and goodness-of-fit tests.

89. Can make necessary modifications in existing programs to adapt them for use in given problem-solving situations. This would include adopting programs from other languages and computer installations.

90. Is thoroughly familiar with internal word formats used to represent data. Knows, for example, how the number "123" would be represented if treated (a) as a character string, (b) as an integer, (c) as a floating number.

91. Demonstrates an understanding of the practical limitations of computer usage. In particular, for a given situation can accurately estimate turnaround times, programming resources, data preparation resources, data coding problems and other practical aspects of electronic data processing.

92. Given specifications, can write programs in ALGOL and/or FORTRAN to perform sophisticated projection applications. Such applications include first- and second-order polynomial regression, Markov processes, and mathematical modeling.

93. Can provide specifications for the writing of programs in ALGOL and/or FORTRAN to perform sophisticated projection applications including first and second-order polynomial regression, Markov processes, and mathematical modeling.

94. Given specifications can write programs in ALGOL and/or FORTRAN to perform common multivariate applications.

95. Can provide specifications for the writing of programs in ALGOL and/or FORTRAN to perform common multivariate applications.

96. Demonstrates a knowledge of computer simulation techniques and major simulation languages.

97. Can design and implement a computer simulation of a complex educational system.

Research, Evaluation, and Planning

98. Can design charts - such as histograms, trend line graphs, cross break tables, and pie graphs - to communicate research and/or evaluation findings to professional educators and the lay public.

99. Can develop forms for graphic presentation of planning elements and responsibilities (planning, programming, budgeting and evaluation matrices).

100. Can summarize data taken from non-computer based information systems.

101. Can synthesize and provide written reports of the results of process evaluation.

102. Can provide concise summaries of technical articles published in relevant professional journals (e.g., Psychometrika, Biomtrica).

103. Can read and understand relevant portions of basic design and statistics texts. Such texts are on the level of Edwards (1960), Cox (1958), Hays (1963), Lindquist (1953), Glass and Stanley (1970), and Winer (1962). (This implies an understanding of the topics included in such texts.)

104. Can understand evaluation and research reports and journal articles, which incorporate descriptive statistics, e.g., mean, median, standard deviation, percentiles, grade-equivalents, correlations.

105. Can design, implement, write, and/or interpret research and/or evaluation reports which incorporate descriptive statistics, e.g., mean, median, standard deviation, percentiles, grade-equivalents, correlations.

106. Can understand research and evaluation reports incorporating simple inferential statistics, e.g., t-test, simple analysis of variance, point and interval estimation, as well as survey research and needs assessment.

107. Can define a relevant population and formulate sampling specifications for data collection purposes utilizing a sampling plan incorporating simple random, stratified, systematic, or cluster sampling techniques.

108. Can design, implement, write, and/or interpret a needs assessment.

109. Can design, implement, write, and/or interpret survey research using a questionnaire.

110. Can describe basic concepts involved in parameter estimation, e.g., bias, precision, consistency, etc., as well as the logic of hypothesis testing and inferential statistics.

111. Can describe basic theoretical concepts relating to distribution-free statistics, e.g., robustness, asymptotic relative efficiency, stochastic inequality, location, and scale.

112. Can apply appropriately the major nonparametric techniques, e.g., Mann-Whitney, Wilcoxen, Chi-Square, Kruskal-Wallis, Friedman.

113. Can understand evaluation and research reports and journal articles which incorporate univariate analysis of variance and covariance, discriminant analysis, factor analysis, regression analysis, multivariate analysis of variance and covariance, Bayesian inference and path analysis.

114. Understands the data-based approach to curriculum construction.

115. Can design, implement, and maintain formative evaluation systems to aid program managers in curriculum construction.

116. Can review and synthesize research literature in a given substantive area.

117. Understands major educational and psychological theories used to represent knowledge of behavior and learning processes (e.g., Skinner, Gagne, Gibson, Piaget, Ausubel).

118. Can relate psychological theories having different emphases in a complementary manner (e.g., Skinner, Piaget, Bandura, Chomsky).

119. Can demonstrate a knowledge of contemporary research literature including areas of investigation, substantive findings, and research methods (e.g., Bandura, Bower, Flavell, Staats).

120. Can conceptualize, plan, implement, and report programmatic research designed to systematically advance knowledge about the learning process through incorporating established research literature and theory into a longitudinal basic and applied research program.

121. Can frame school learning problems as extensions of learning and developmental theory and research outcomes (e.g., Bloom, Scandura, Staats, Becker).

122. Is familiar with the methodology and results of aptitude-treatment and trait-trait interaction studies (e.g., Bracht, Cronbach and Snow, Johnson and Neyman).

123. Can read and understand relevant portions of basic operations research texts. Such texts are on the level of Sasieni, Yaspan, and Friedman (1959), Beer (1966), and Miller and Star (1969). (This implies an understanding of the topics included in such texts.)

124. Can read and understand relevant portions of basic computer simulation texts. Such texts are on the level of Mize and Cox (1968) and Hadley (1963). (This implies an understanding of the topics included in such texts.)

125. Can demonstrate a knowledge of major planning systems and components including Educational Resources Management Systems (ERMS), Program Evaluation and Review Technique (PERT), Management Information Systems (MIS), Programming, Planning, and Budgeting System (PPBS), and general systems analysis procedures.

126. Can understand research and evaluation reports and journal articles incorporating cost-benefit and cost-effectiveness analysis, linear programming techniques, math modeling, and projections utilizing first and second-order polynomial regression and stochastic processes.

127. Can publish in professional journals in specific areas of interest.

128. Can design, implement, write, and/or interpret resource allocation reports.

129. Can reduce a resource allocation to a cost-element structure.

130. Can demonstrate a knowledge of the requisite components to be included in a management plan.

131. Can prepare grant proposals for funding.

132. Can articulate current crucial issues in education and where to find research literature relative to them.

133. Can discuss emergent developments in the field of educational evaluation and, in light of those developments, distinguish among various conceptualizations of evaluation, accountability, research, audit, and measurement.

134. Can outline the salient characteristics of at least two major evaluation models and compare and contrast the focal points of each.

135. Can describe the application of and the relationship existing among the major theoretical distributions of statistics, e.g., the normal, multivariate normal, binomial, hypergeometric, poisson, chi-square, and variance-ratio.

136. Can describe basic concepts of analysis of variance, e.g., design matrix, random effect, fixed effect, interaction, confounding, and error and relate those concepts to various ANOVA designs.

137. Can relate traditional analysis of variance to regression analysis (the general linear model) and describe the effects of utilizing various least squares estimation approaches (e.g., backword elimination, forward selection, stepwise regression) on observed results.

138. Can read and understand relevant portions of intermediate design and statistics texts. Such texts are on the level of Draper and Smith (1966), Morrison (1967), and Whitla (1968). (This implies an understanding of the topics included in such texts.)

139. Can read and understand relevant portions of intermediate operations research texts. Such texts are on the level of Churchman, Ackoff, and Arnoff (1957), Hillier and Lieberman (1967), and Wagner (1969).

140. Can read and understand relevant portions of intermediate computer simulation texts. Such texts are on the level of Chorafas (1965) and Emshoff and Sisson (1970).

141. Can discuss the logic of statistical analysis, the major classes of questions that can be addressed by present modes of analysis, the classes of assumptions that can be accommodated by present statistical technology, and the emergent developments in the field.

142. Can present a case for the evaluation of competing instructional strategies and suggest alternate methodologies which might be used.

143. Can design and monitor evaluation studies that monitor the implementation of projects.

144. Can design, implement, write, and/or interpret controlled research studies that are focused on improving the educational process.

145. Can develop and implement an evaluation or research design to fit a particular applied situation that evidences adequate sampling procedures, instrumentation, planned information collection, data analysis, and controls for threats to the internal and external validity of evaluation results (this encompasses many other competencies and can be done at the level of the individual, e.g., at competency level 146 or at competency level 158).

146. Can design, implement, write, and/or interpret research or evaluation reports incorporating simple inferential statistics, e.g., t-test, simple analysis of variance, point and interval estimation.

147. Can design, implement, write, and/or interpret aptitude-treatment and trait-trait interaction studies.

148. Can design, implement, write, and/or interpret projection reports utilizing first and second-order polynomial regression.

149. Can design, implement, write, and/or interpret projection reports utilizing stochastic processes.

150. Can synthesize a mathematical model of a complex system from written and verbal input of non-technical managers.

151. Can operationalize major planning systems in an educational setting including Educational Resources Management Systems (ERMS), Program Evaluation and Review Technique (PERT), Management Information Systems (MIS), Programming, Planning and Budgeting System (PPBS), and general systems analysis procedures.

152. Can design, implement, write, and/or interpret reports incorporating cost-benefit and cost-effectiveness analysis.

153. Can design, implement, write, and/or interpret reports utilizing the principles of operations research.

154. Can specify, operationalize, and apply criteria for evaluating planning and evaluation systems.

156. Can design, implement, write, and/or interpret research and/or evaluation reports incorporating higher order analysis of variance and covariance, discriminant analysis, and regression analysis.

157. Can design, implement, write, and/or interpret reports incorporating linear programming techniques.

158. Can design, implement, write, and/or interpret research and/or evaluation reports incorporating factor analysis and multivariate analysis of variance and covariance.

159. Can conceptualize a set of performance indicators that would form a sound basis theoretically and practically for the School District's systematic evaluative information system.

160. Can critique an evaluation or research design in terms of its internal and external validity, appropriateness of methodology, appropriateness of instrumentation, etc.

Management

161. Can provide realistic resource estimates for a specific planning, research, or evaluation project.

162. Can systematically plan the implementation of a planning, research, or evaluation project. Considerations include timeline, required resources, and specification of factors that might impinge on successful completion.

163. Can effectively control, direct, and supervise subordinates. This includes the utilization of employee work time in a most expedient and beneficial manner, the establishment and implementation of a fair and objective employee evaluation system, the periodic review of individual progress toward assigned goals, and the handling of personal personnel problems in a discrete and emphathetic manner.

164. Can effectively articulate and interpret School District and departmental policy to subordinates.

165. Can maintain good rapport with other District departments and represent the department in a cooperative and productive manner at numerous formal and informal meetings with District personnel.

166. Can maintain good rapport and represent the District in a cooperative and productive manner at numerous formal and informal meetings with personnel from other agencies engaged in planning, research, and evaluation activities.

167. Can plan, procure, and maintain a departmental library.

168. Can supervise custodial maintenance of the physical plant.

169. Can provide realistic resource estimates for a planning, research, and evaluation program and allocate those resources to accomplish stated goals. This includes the preparation and administration of a program budget.

170. Can establish and implement a management-by-objectives system for a planning, research, and evaluation unit. This includes a management control system that monitors the implementation of all research and evaluation projects undertaken by the unit.

171. Can establish and implement, within the guidelines set forth by affirmative action, a systematic recruiting system for planning, research, evaluation, and computer science personnel.

172. Initiates and obtains required administrative and Board approval on all personnel documents and arbitrates any personnel disputes.

173. Can both envision and articulate (in verbal and written form) longitudinal and cross-sectional departmental goals as they relate to District goals and policy.

174. Can use evaluation information to effect rational decisions about departmental goals and strategies.

175. Can negotiate the political system of the parent institution in such a manner as to ensure that objective data reach principal decision makers and that planning, research, and evaluation activities are valued and supported.

References

Beer, S. Decision and control: the meaning of operational research and management cybernetics. New York: Wiley, 1966.

Bieri, J. Complexity-simplicity as a personality variable and preferential behavior. In D.W. Fiske & S. R. Maddi (Eds.), Functions of Varied Experience. Homewood, Ill.: Dorsey Press, 1961.

Beiri, J., Atkins, A. L., Scott, B., Leaman, R. L., Miller, H., and Tripodi, T. Clinical and social judgement: The discrimination of behavioral information. New York: John Wiley & Sons, Inc., 1966.

Bracht, G.H. The relationship of treatment tasks, personalogical variables and dependent variables to aptitude-treatment interactions. Unpublished doctoral dissertation, University of Colorado, 1969.

Bracht, G. H., Hopkins, K. D., and Stanley, J. C. Perspectives in educational and psychological measurement. Englewood Cliffs, N. J.: Prentice-Hall, 1972.

Bruner, J. S. and Tajfel, H. Cognitive risk and environmental change. Journal of Abnormal Psychology, 1961, 62, 231-241.

Churchman, C. W., Ackoff, R. L., and Arnoff, E. L. Introduction to operations research. New York: Wiley, 1957.

Cox, D. Planning of experiments. New York: Wiley, 1958.

Cronbach, L. J. Essentials of psychological testing. Scratton, Penn.: Harper & Row, Publishers, Inc., 1970.

Cronbach, L. J. and Snow, R. Individual differences in learning ability as a function of instructional variables. Final Report, U. S. Office of Education, Contract No. OEC 4-6-061269-1217. Stanford, California: Stanford University, School of Education, March 1969.

Cronbach, L. J. and Suppes, P. Research for tomorrow's schools: Disciplined inquiry for education. New York: Macmillan, 1969.

Draper, N. R. and Smith, H. Applied regression analysis. New York: Wiley, 1966.

Edwards, A. L. Experimental design in psychological research. New York: Rinehart, 1960.

Gardner, R. W. and Long, R. I. Control, defense, and centration effect: A study of scanning behavior. British Journal of Psychology, 1962, 53, 129-140.

Gardner, R. W. and Schoen, R. A. Differentiation and abstraction in concept formation. Psychological Monographs, 1962, 76, No. 41.

Gardner, R. W., Holzman, P. S., Klein, G. S., Linton, H. B., and Spence, D. Cognitive control: A study of individual consistencies in cognitive behavior. Psychological Issues, 1959, 1, No. 4.

Glass, G. V. and Stanley, J. C. Statistical methods in education and psychology. Englewood Cliff, N. J.: Prentice-Hall, 1970.

Gulliksen, H. Theory of mental tests. New York: Wiley, 1950.

Hadley, G. and Whiten, T. M. Analysis of inventory systems. Englewood Cliffs, N. J.: Prentice-Hall, 1963.

Harvey, O. J., Hunt, D. E., Schroder, H. M. Conceptual systems and personality organization. New York: John Wiley and Sons, Inc., 1961.

Hays, W. L. Statistics for psychologists. New York: Holt, Rinehart and Winston, 1963.

Helmstadter, G. C. Principles of psychological measurement. New York: Appleton-Century-Crofts, 1964.

Hillier, F. S. and Lieberman, G. J. Introduction to operations research. San Francisco: Holden-Day, 1967.

Holzman, P. S. The relation of assimilation tendencies in visual, auditory, and kinesthetic time-error to cognitive attitudes of leveling and sharpening. Journal of Personality, 1954, 22, 375-394.

Holzman, P. S. Scanning: A principle of reality contact. Perceptual and Motor Skills, 1966, 22, 835-844.

P. S. and Klein, G. S. Cognitive system principles of leveling and sharpening: Individual differences in assimilation effects in visual time-error. Journal of Psychology, 1954, 37, 105-122.

Horst, P. Psychological measurement and prediction. Belmont, California: Wadsworth Publishing, Co., 1966.

Kagan, J. Reflection-impulsivity and reading ability in primary grade children. Child Development, 1965, 36, 609-628.

Kagan, J., Moss, H. A., and Sigel, I. E. Conceptual style and the use of affect labels. Merrill-Palmer Quarterly, 1960, 6, 261-278.

Kagan, J., Moss, H. A., and Sigel, I. E. Psychological significance of styles of conceptualization. In J. C. Wright and J. Kagan (Eds.), Basic cognitive processes in children. Monograph of Society for Research in Child Development, 1963, 28, No. 2, 73-112.

Kagan, J., Rosman, B. L., Day, D., Albert, J., and Phillips, W. Information processing and the child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78, (Whole No. 58).

Kelley, G. A. The Psychology of Personal Constructs. New York: W. W. Norton and Company, Inc., 1965.

Klein, G. S. Need and regulation. In M. R. Jones (Ed.), Nebraska symposium on motivation. Lincoln, Neb.: University of Nebraska Press, 1954, 225-274.

Klein, G. S., Gardner, R. W., and Schlesinger, H. J. Tolerance for unrealistic experiences: A study of the generality of a cognitive control. British Journal of Psychology, 1962, 53, 41-55.

Lindquist, E. F. Educational measurement. Washington: American Council on Education, 1951.

Lindquist, E. F. Design and analysis of experiments in psychology and education Boston: Houghton Mifflin, 1953.

Messick, S. The criterion problem in the evaluation of instruction: Assessing possible not just intended outcomes. In M. C. Wittrock and David E. Wiley (Eds.), The Evaluation of Instruction: Issues and Problems. New York: Holt, Rinehart, and Winston, Inc., 1970.

Messick, S. and Kogan, N. Differentiation and compartmentalization in object-sorting measures of categorizing style. Perceptual and Motor Skills, 1963, 16, 47-51.

Miller, D. W. and Starr, M. K. Executive decisions and operations research. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969.

Mize, J. H. and Cox, G. J. Essentials of stimulation. Englewood Cliffs, N. J.: Prentice-Hall, 1968.

Morrison, D. F. Multivariate statistical methods. New York: McGraw-Hill, 1967.

Nunnally, J. C. Tests and measurements: assessment and prediction. New York: McGraw-Hill, 1959.

Pettigrew, T. F. The measurement and correlates of category width as a cognitive variable. Journal of Personality, 1958, 26, 532-544.

Provus, M. Evaluation of ongoing programs in the public school system. NSEE 68th Yearbook, Part II, 1969.

Salomon, G. S. Internalization of filmic schematic operations in relation to individual differences. American Educational Research Journal, 1973.

Sasieni, M., Yaspan, A., and Friedman, L. Operations research - methods and problems. New York: Wiley, 1959.

Schlesinger, H. J. Cognitive attitudes in relation to susceptibility to interference. Jounal of Personality, 1954, 22, 354-374.

Scott, W. A. Conceptualizing and measuring structural properties of cognition. In O. J. Harvey (Ed.), Motivation and Social Interaction. New York: The Ronald Press Company, 1963.

Scriven, M. The methodology of evaluation, In R. Tyler, R. Gagne, and M. Scriven (Eds.), Perspectives of Curriculum Evaluation (AERA Monograph 1). Chicago, Ill.: Rand McNally and Company, 1967.

Stake, R. E. The countenance of educational evaluation. Teachers College Record, 1967, 68, 523-540.

Stufflebeam, D. L., et al. Educational evaluation and decision making. Itasca, Ill.: F. E. Peacock Publishers, Inc., 1971.

Torgerson, W. S. Theory and methods of scaling. New York: Wiley, 1958.

Wagner, H. M. Principles of operations research with applications to managerial decisions. Englewood Cliffs, N. J.: Prentice-Hall, 1969.

Webster, W. J. and Mendro, R. L. A pragmatic model for a comprehensive public school research and evaluation system. Submitted for publication to Educational Leadership, 1974a.

Webster, W. J. and Mendro, R. L. The investigation of aptitude-treatment interactions as an integral part of program evaluation. Journal of Experimental Education, Vol. 43, Fall, 1974b, 86-91.

Whitla, D. K. Handbook of measurement and assessment in behavioral sciences. Reading, Mass.: Addison-Wesley, Publishing, Co., 1968.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1962.

Witkin, H. A. Dyk, R. B., Faterson, H. F., Goodenough, D. R., and Karp, S. A. Psychological Differentiation. New York: John Wiley and Sons, Inc., 1962.